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1/11/76

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION
RESEARCH PROJECT INITIATION

Date: February 12, 1976

Project Title: Student Science Training for High Ability Secondary School Students

Project No: E-27-132

Principal Investigator: Dr. John L. Lundberg

Sponsor: National Science Foundation

Agreement Period: From 1/26/76 Until 10/31/76

Type Agreement: Grant No. SMI76-05286

Amount: \$25,650

Reports Required: Annual Letter Technical; Final Report

Sponsor Contact Person(s): Administrative Matters
THRU OCA
Mr. Gaylord L. Ellis
Grants Officer
National Science Foundation
Washington, D. C. 20550
(202) 632-5965

Assigned to: Textile Engineering

COPIES TO:

Principal Investigator	Library
School Director	Rich Electronic Computer Center
Dean of the College	Photographic Laboratory
Director, Research Administration	Project File
Director, Financial Affairs (2)	
Security-Reports-Property Office ✓	
Patent Coordinator	Other _____

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION

Posted
5-24

Date: April 4, 1977

Project Title: Student Science Training for High Ability Secondary School Students

Project No: E-27-532

Project Director: Dr. John L. Lundberg

Sponsor: National Science Foundation

Effective Termination Date: October 31, 1976

Clearance of Accounting Charges: October 31, 1976

Grant/Contract Closeout Actions Remaining: NONE

- ☐ Final Invoice and Closing Documents
- ☐ Final Fiscal Report
- ☐ Final Report of Inventions
- ☐ Govt. Property Inventory & Related Certificate
- ☐ Classified Material Certificate
- ☐ Other _____

Assigned to: Textile Engineering (School/Laboratory)

COPIES TO:

Project Director
Division Chief (EES)
School/Laboratory Director
Dean/Director-EES
Accounting Office
Procurement Office
Security Coordinator (OCA) ✓
Reports Coordinator (OCA)

Library, Technical Reports Section
Office of Computing Services
Director, Physical Plant
EES Information Office
Project File (OCA)
Project Code (GTRI)
Other _____

E-27-532
1cy

GEORGIA INSTITUTE OF TECHNOLOGY
ATLANTA, GEORGIA 30332

OFFICE OF
THE DIRECTOR OF
FINANCIAL AFFAIRS

March 1, 1977

Division of Grants & Contracts
National Science Foundation
Washington, D. C. 20550

Gentlemen:

Enclosed is the original and two copies of the final fiscal report for grant number SMI76-05286.

If you have any questions or desire additional information, please let me know.

Sincerely yours,

C. Evan Crosby/
Associate Director of
Financial Affairs

CEC/bs
enclosures:

cc: Dr. W. D. Freeston
Dr. J. L. Lundberg
Mr. E. E. Renfro
Mr. A. H. Becker ✓
File E-27-532

[illegible]

E-27-532

NATIONAL SCIENCE FOUNDATION
Washington, D.C. 20550

SUMMARY OF COMPLETED PROJECT

Form Approved
OMB No. 99R0013*Please read instructions on reverse carefully before completing this form.*

1. INSTITUTION AND ADDRESS Georgia Institute of Technology Atlanta, Georgia 30332		2. NSF PROGRAM Student Science Training Program	3. GRANT PERIOD Jan. 26, 1976 to from Oct. 31, 1976 to
4. GRANT NUMBER SMI76-05286	5. BUDGET DUR. (mos) 9 ¹ / ₆	6. PRINCIPAL INVESTIGATOR(S) John L. Lundberg	7. GRANTEE ACCOUNT NUMBER E-27-532
8. SUMMARY (Attach list of publications to form)			

Fifty-six students from 44 high schools in eleven states worked on 56 different research projects with 36 research advisers from ten schools and the Engineering Experiment Station at Georgia Tech and one adviser from the Fernbank Science Center. Most studies were multidisciplinary. Disciplines, major subjects and materials involved were chemistry (31 projects), engineering (17), life sciences (13), physics (9), computing (9), energy (6), environment (6), nucleonics (1), polymers (15), fibers (5), and textiles (13 projects). Good results in the form of materials, structures, methods or data were produced in about half of the projects; some results will be published as parts of research now in progress.

Participants attended 41 seminars in which science, engineering, and mathematics were discussed and demonstrated without the usual separation into disciplines. Emphasis was on our macromolecular environment with discussion of polymers, fibers and textiles. Nine speakers from other schools at Georgia Tech or from off campus presented eight colloquia; students savored these, particularly in retrospect. Ten optional seminars on mechanics, thermodynamics, quantum mechanics, and statistical thermodynamics; eleven special seminars on mathematics (requested by participants); five two-hour seminars on computers; extensive tutoring in computing, and twelve showings of 22 motion pictures on science were offered. All participants took part in additional seminars on computing, English, lab safety, and reports on their research. Three field trips, to an observatory and planetarium, to a nylon fiber plant and nuclear and hydroelectric energy complex and to botanical gardens and an experimental farm demonstrated applied sciences and engineering at work. Thirteen group social activities including eight off-campus outings and five picnics or suppers were provided.

Students seemed to benefit from study of science, engineering and mathematics without separation into subjects or disciplines. The diversity of research opportunities, unstructured work with individual attention, catholic treatment of science and engineering, and the wide variety in activities required participants to select among many alternatives and to work on their own. Most did well making the transition from the limited choices of rigidly structured secondary schools to the diversity of the technical university.

9. SIGNATURE OF PRINCIPAL INVESTIGATOR/ PROJECT DIRECTOR	TYPED OR PRINTED NAME John L. Lundberg	DATE March 29, 1977
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E-27-532

FINAL REPORT

1976 National Science Foundation Student Training Program
in
Polymer, Fiber & Textile Science & Engineering
at the
Georgia Institute of Technology

June 13 - July 30, 1976

- Abstract -

Fifty-six students from 44 high schools in eleven states worked on 56 different research projects with 36 research advisers from ten schools and the Engineering Experiment Station at Georgia Tech and one adviser from the Ferbank Science Center. Most studies were multidisciplinary. Disciplines, major subjects and materials involved were chemistry (31 projects), engineering (17), life sciences (13), physics (9), computing (9), energy (6), environment (6), nucleonics (1), polymers (15), fibers (5), and textiles (13 projects). Good results in the form of materials, structures, methods or data were produced in about half of the projects; some results will be published as parts of research now in progress.

Participants attended 41 seminars in which science, engineering, and mathematics were discussed and demonstrated without the usual separation into disciplines. Emphasis was on our macromolecular environment with discussion of polymers, fibers and textiles. Nine speakers from other schools at Georgia Tech or from off campus presented eight colloquia; students savored these, particularly in retrospect. Ten optional seminars on mechanics, thermodynamics, quantum mechanics, and statistical thermodynamics; eleven optional seminars on mathematics (requested by participants); five two-hour seminars on computers; extensive tutoring in computing, and twelve showings of 22 motion pictures on science were offered. All participants took part in additional seminars on computing, English, lab safety, and reports on their research. Three field trips, to an observatory and planetarium, to a nylon fiber plant and nuclear and hydroelectric energy complex, and to botanical gardens and an experimental farm demonstrated applied science and engineering at work. Thirteen group social activities including eight off-campus outings and five picnics or suppers were provided.

Students seemed to benefit from study of science, engineering and mathematics without separation into subjects or disciplines. The diversity of research opportunities, unstructured work with individual attention, catholic treatment of science and engineering, and the wide variety in activities required participants to select among many alternatives and to work on their own. Most did well making the transition from the limited choices of rigidly structured secondary schools to the diversity of the technical university.

Submitted by:

John L. Lundberg
NSF-SSTP Director
School of Textile Engineering
Georgia Institute of Technology

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I. Preparation

A. Advertising

The School of Textile Engineering prepared a brochure (Appendix I) for distribution before awards of grants were announced. These were distributed to all principals, counselors, and science and math teachers in public schools and many private and parochial schools in Georgia. Distributions were made by direct mail to the schools, through science coordinators in the larger systems and to teachers at their homes through listings by the Georgia Education Association and the Science Teachers Association. In spite of double coverage to most teachers and schools and triple coverage in the larger school districts many teachers are unaware of our program. In principle all of these schools and teachers received the listing of all SST programs distributed by the Foundation.

Mr. Dallas Stewart, Science Coordinator, Education Department of the State of Georgia, and Mr. Lonnie Love, Assistant Coordinator, have been most helpful in 1973 - 76 in aiding us in contacting teachers, counselors, principals and school administrators. Thanks to their efforts we have been in contact with and participated in science programs of the regional resource centers in Georgia and in the Governor's Honors Program for high school students.

We advertised our program at science fairs, group meetings of students and/or teachers, and in our visits to high schools and talks for high school science classes. Mr. Craig Anderson, recruiter and adviser for incoming students for Georgia Tech's School of Textile Engineering publicized our program in his visits to high schools in Georgia.

Our best advertising is by students who have been in the program and by teachers whose students have participated in our program. In the last two

years teachers in the Atlanta public schools have encouraged their students to participate. Miss Kathryn Hertzka, Science Coordinator for the Atlanta School System, has helped our faculty to become acquainted with teachers and students in Atlanta, this by including faculty members in science programs and the Atlanta Science Congress.

B. Selecting Students

Two hundred plus students inquired about our SST program. Seventy (70) students submitted applications. We accepted sixty five (65) of these as participants or alternates whom we would welcome into the program.

Again in 1976, students selected themselves for our program. Only those who are seriously interested bother with the application forms and short essay. Most of the students who apply have sufficient desire and drive to succeed in our SST program. The same is true of applicants for admission to Georgia Tech. Only seriously interested, committed students come here; easier schools are accessible for those who just want to go to college. This reputation of Georgia Tech "rubs off" on our SST program.

Each year we realize how little we know about selecting participants. We try to select on the following bases (in descending order of importance):

1. personal interviews with applicants,
2. telephone conversations with applicants,
3. statements in 300 words or less why the applicants wish to participate in the program,
4. face to face and telephone conversations with teachers,
5. teachers written recommendations,
6. class rank,
7. grades in high school courses, and
8. scores on standardized examinations.

Mr. Craig Anderson, counselor for incoming students in the School of Textile Engineering, and the program director interviewed about one third of the applicants and talked to the others by telephone. We accepted a

few students from the Atlanta city schools and two or three from other communities in Georgia and Alabama who should not have been accepted on the basis of test scores. For these students we found little correlation among the quality of students' written statements, teachers' recommendations, class rank, grades in courses, and scores on standardized examinations. Because of our interviews of all applicants from Atlanta in 1975 and careful consideration of grade, class rank and PSAT scores and our experience with students from less than advantaged schools, we could estimate which of the low score students could participate successfully in our SST program.

Of the sixteen (16) students whom we accepted as participants or welcome alternates and who did not participate in our SST program, five (5) attended other SST programs, three (3) participated in other summer programs, and one was ill and could not attend. Two (2) students started the program but dropped out because they found summer jobs and needed money. One participants' mother withdrew her from the program because we could not place her in research in the narrow area of animal behavior in which she stated interest. (We could place her in other areas of animal behavior).

C. Soliciting Funds

We asked textile, fiber, carpet, and chemical manufacturers for financial help with the program. In this year of recovery from recession \$4700 was contributed by five corporations. Our record on NSF grants, private support and numbers of contributors to date is as follows:

<u>Year</u>	<u>NSF Grant</u>	<u>Private Gifts</u>	<u>Number of Participants</u>
1973	\$15,776	\$1,750	31
1974	\$11,430	\$7,200	38
1975	\$21,170	\$1,500	37
1976	\$20,660	\$4,700	53*

* (Fifty six students started the program; three dropped out).

II. Participants

A. Profile

We compare our SSTP participants to our undergraduate students at Georgia Tech. About ninety percent of these are engineering, science and architecture majors with the majority in engineering. The average SAT score is about 1200. Compared to these undergraduates, we rate as good (with grade 2.0 or C) those SSTP applicants whom we would welcome as undergraduates. With this frame of reference, our estimates of the participants and other applicants before the start of the program is given in Table II.

Table I

Estimated Potential for Research Performance of Participants
and Other Applicants to Georgia Tech's 1976 SST Program

	<u>Gifted</u> <u>(4.0=A)</u>	<u>Very</u> <u>Good</u> <u>(3.0=B)</u>	<u>Good</u> <u>(2.0=C)</u>	<u>Fair</u> <u>(1.0=D)</u>	<u>Poor</u> <u>(0.0=F)</u>	<u>Totals</u> <u>Number</u>	<u>Avg.G</u>
Participants	8	13	11	15	6	53	2.0
Limited opportunity	2	6	5	11	6	30	1.1
Other applicants	2	3	4	5	3	17	1.5
Limited opportunity	0	0	0	3	3	6	1.1

At least thirty (30) of the fifty-three (53) participants have had limited opportunity to study and work in science. Further description of the group is given by the following data:

Number of girls	19
Number of boys	37
Number of members of "minority groups"	18
Number of inner city	14
Number from smaller cities	14
Number from suburbs	13
Number from small towns and rural areas	12
Number from Georgia	32
Number from other states	21
Number with good to superior over-all opportunity	23
Number whose opportunity could be improved	30

We had a good mixture of students with a wide variety of interests, backgrounds, preparation and developed ability. This diversity is necessary for and conducive to learning. The participants learned at least as much from each other and Tech students as they did from faculty and staff. By interacting with peers a number discovered and developed latent interests and abilities.

B. Participants' Names, Addresses, High Schools and Research Projects and Research Advisers

Jay David Abramowitz 18230 Caprice Nassau Bay, Texas 77058	Computer Simulation for Pattern Packing - M. Konopasek & H. Coff Computer Simulation for Heat Transfer - L. H. Olson CLEAR CREEK HIGH SCHOOL - SENIOR
Thomas Henry Applewhite Route 1, Box 313 Lakesburg, Georgia 31763	Kirlian Photography - M.E. Sikorski & J. L. Lundberg LEE COUNTY HIGH SCHOOL - SENIOR
Althea Charisse Barner 3174 Latona Drive Atlanta, Georgia 30327	Flammability of Carpets - W. C. Tincher WALTER F. GEORGE HIGH SCHOOL - SENIOR
Anna Maria Barnes 1030 Mt. Paran Road, N.W. Atlanta, Georgia 30327	Mechanical Response of Human Hair - B. R. Livesay (EES) NORTHSIDE HIGH SCHOOL - SENIOR
Vanessa Renee Barnes 875 Rodney Drive, S.W. Atlanta, Georgia 30311	Mechanical Response of Human Hair - B. R. Livesay (EES) SOUTHWEST HIGH SCHOOL - SENIOR

William Henry Binns
2301 Greenwood Drive
Albany, Georgia 31707

Quinest Ricardo Blount
Route 3, Box 97
Greenville, Georgia 30222

Kathleen May Bosson
213 W. Vanderbilt Loop
Montgomery, Alabama 36109

Mark Stephen Bruenmer
6012 North Bales
Kansas City, Missouri 64118

Andrew Donald Burt
2772 Joel Place
Doraville, Georgia 30340

Pearl Ruth Casne
108 South 18th Street
Pittsburg, Pennsylvania 15203

*Fredrick Wayne Chaney
90 Oakridge Avenue, S.E.
Atlanta, Georgia 30317

Ann Therese Cronley
6840 Peachtree Dunwoody Road
Atlanta, Georgia 30328

William Gordon Davis
6410 Long Island Drive
Atlanta, Georgia 30328

Maureen Elizabeth Dobel
9946 High Drive
Leawood, Kansas 66206

Brenda Marie Edwards
2313 West Main Street
Prichard, Alabama 36610

Sandra Dee Ferguson
6969 Rockbridge Road
Stone Mountain, Georgia 30058

Kirlian Photography - M.E. Sikorski
& J. L. Lundberg
DEERFIELD HIGH SCHOOL - SENIOR

Effects of Lubricants on Operation
of Weaving Machines - A. Tayebi & S.
GREENVILLE HIGH SCHOOL - SENIOR

Computer Simulation: Management
Problems - L.H. Olson & D.R. Gentry
ROBERT E. LEE HIGH SCHOOL - SENIOR

X-ray Diffraction Studies of Polym
Structures - K. Ko & R.A. Young
OAK PARK HIGH SCHOOL - SENIOR

Fiber Optics: A Light Source for a
Microfurnace for Growing Liquid
Crystals - D. C. O'Shea (Phys)
PEACHTREE HIGH SCHOOL - JUNIOR

Analysis of Essential Oils from
Eucalyptus and Caraway -
J. A. Stanfield (Chem)
SOUTH HIGH SCHOOL - JUNIOR

Computer Storage and Accessing of
Technical Information - M. Konopac
J. C. MURPHY HIGH SCHOOL - SENIOR

Color Perception by Humans -
W. C. Tincher
NORTH SPRINGS HIGH SCHOOL - SENIOR

Resistance of Bacillus Cereus to
Tetracycline - E. K. Yeagers (Bio)
RIVERWOOD HIGH SCHOOL - SENIOR

Solubility of Ferricinium in Acetic
Water Solutions - H. M. Neumann (C)
NOTRE DAME DE SION HIGH SCHOOL - SENIOR

1. Molding New Ceramics -
A. T. Chapman (Cer Engrg)
2. Vulcanization of Rubber - W.C.
M.T. BLOUNT HIGH SCHOOL - SENIOR

Flammability of Carpets: Effects of
Cleansers - W. C. Tincher
STONE MOUNTAIN HIGH SCHOOL - SENIOR

(*Dropped out of program to work.)

Thomas Adam Fisher
108 E. Watkins Street
Augusta, Georgia 30901

Michael John Forst
43 W. View Lane
Cocoa Beach, Florida 32931

Richard Gene Fuqua
P. O. Box 198
New Johnsonville, Tennessee 37134

+Ann Ruth Gauld
2560 Raintree Way
Marietta, Georgia 30067

Roderick Derum Gay
2916 Peek Road
Atlanta, Georgia 30318

James Haywood Graddy
P. O. Box 234
Cottonwood, Alabama 36320

David Markock Gurley
130 East Broad Street
Camilla, Georgia 31730

Charles P. "Buddy" Hill
406 Joseph Avenue
Donalsonville, Georgia 31745

Holly Jean Hutmaire
21 Columbia Avenue
Takoma Park, Maryland 20012

Keith Clayton Jones
8214 Chancery Court
Alexandria, Virginia 22308

Photodegradation of Nylon -
W. C. Carter
ACADEMY OF RICHMOND COUNTY - SENIOR

Computers: Developing a Bank of Knowledge and Access Thereto - M. Konopasek
COCOA BEACH HIGH SCHOOL - SENIOR

Water Purification by Radiation -
G. G. Eichholz (Nucl. Engrg)
WAVERLY CENTRAL HIGH SCHOOL - SENIOR

Animal Behavior -
R.K. Davenport (Psych.)
WHEELER HIGH SCHOOL - SENIOR

Measurements of Ozone Concentration in Air and Effects on Plants -
J. L. Lundberg
FREDERICK DOUGLASS HIGH SCHOOL - JUNIOR

Spectral Characteristics of Acid-Base Indicators on Nylon - W. C. Carter
COTTONWOOD HIGH SCHOOL - SENIOR

1. Pendula and Harmonographs - F. Smith

2. Computer Computations in Classical Mechanics - M. Konopasek
WESTWOOD SCHOOLS - JUNIOR

Computer Problems: 1. Further Development of the Question and Answer System, 2. Artificial Intelligence
M. Konopasek
SEMINOLE COUNTY HIGH SCHOOL - SENIOR

Development of Fast Firing Ceramic
J. K. Cochran (Cer. Engrg)
MONTGOMERY BLAIR HIGH SCHOOL - SENIOR

Development of Improved Sheets for Beds and Burn Patients - W.D. Free
FORT HUNT HIGH SCHOOL - SENIOR

(+Ann Gauld's mother withdrew her from the program because we could not place Ann in a research problem in the narrow area of animal behavior in which she stated interest.)

Bruce Allen Kennedy
2115 Clairmont Drive
Augusta, Georgia 30904

Stephanie Diana Kirksey
Route 1, Box 21 B1
Tifton, Georgia 31794

Erin Vanessa Langham
323 Bella Street
Prichard, Alabama 36610

Mark Weldon Long
810 West 8th Street
Freeport, Texas 77541

Catherine Maureen Longtin
1209 Summerhill Road
N. Augusta, South Carolina 29841

Arthur Leonard McClellan
Route 1, Box 226-B
Bowman, South Carolina 29018

Brett M. McLeod
4022 Lucerne Drive, S.E.
Huntsville, Alabama 35802

Levern Mechele Miles
213 Chicago Avenue
Prichard, Alabama 36610

Constance Anita Mitchell
2226 Ajeax Drive, N.W.
Atlanta, Georgia 30318

Russell Charles Morton
645 River Valley Road
Atlanta, Georgia 30328

Charleston Ridley, Jr.
Route 3, Box 212-A
Donalsonville, Georgia 31745

Alan G. Roeder
1242 Nelson Street
Dunedin, Florida 33528

1. Anionic Polymerization of Acrylonitrile
Using Crown Ethers.

2. Synthesis of New Polymers - F. L.
Cook & K. Domeshek
ACADEMY OF RICHMOND COUNTY - SENIOR

Packing of Linear Figures into
Regular Arrays - M. Konopasek
TIFT COUNTY HIGH SCHOOL - SENIOR

New Ceramics -
J. F. Benzel (Cer. Engrg)
M. T. BLOUNT HIGH SCHOOL - SENIOR

Meristemming - Clonal Propagation of
Orchids - Angus Heeps (Fernbank Sci. Cntr.)
BRAZOSPORT HIGH SCHOOL - SENIOR

Stability of Reactive Dyes to
Bleaching - W. C. Carter
NORTH AUGUSTA SENIOR HIGH SCHOOL - SENIOR

Polymer Degradation: Polyaramides -
M.E. Sikorski, J.L. Lundberg,
W.C. Tincher & W.C. Carter
BOWMAN HIGH SCHOOL - SENIOR

Substitutes for Gasoline in Internal
Combustion Engines - W. D. Freeston
HUNTSVILLE HIGH SCHOOL - SENIOR

Effects of Additives on the
Flammability of Carpets - W. C. Tincher
M. T. BLOUNT HIGH SCHOOL - SENIOR

Effects of Organic Wastes on Water -
W. C. Tincher & R. Robertson
S. H. ARCHER HIGH SCHOOL - SENIOR

Solar Cells: Gallium Arsenide
Schottky Barriers, Preparation
and Testing - E. L. Meeks (EES)
RIVERWOOD HIGH SCHOOL - SENIOR

Effects of Dye Wastes on Water
W. C. Tincher & A. Tata
SEMINOLE COUNTY HIGH SCHOOL - SENIOR

Design of Hydrofoils -
J. L. Lundberg
DUNEDIN SENIOR HIGH SCHOOL - SENIOR

Timothy John Rydel 252 Sewickley-Oakmont Road Pittsburgh, Pennsylvania 15237	Effects of Hydrolysis on the Amide Content, Dyeability and Strength of Nylon 66 - W. C. Carter NORTH HILLS HIGH SCHOOL - SENIOR
Michael DeAndrea Saffold 522 Crawford Street Donalsonville, Georgia 31745	Effect of Dyes on the Melting Points of Nylons - W. C. Carter SEMINOLE COUNTY HIGH SCHOOL - SENIOR
*Dwayne Lloyd Sanders 2952 Braithwood Court Atlanta, Georgia 30345	Purification of Enzymes - R. Phillips (Chem) & S. W. May (Chem) HENDERSON HIGH SCHOOL - SENIOR
Cynthia Lynne Scott Route 5, Sherry Lane Calhoun, Georgia 30701	Effects of Oxidation on Polyacrylo- nitrile Fiber Properties - A. Tayebi CALHOUN HIGH SCHOOL - SENIOR
James Carmichael Sherman 728 Oberlin Road Augusta, Georgia 30319	Measurement of Blood Flow - D. P. Giddens (AE) ACADEMY OF RICHMOND COUNTY - JUNIOR
Mark John Sikorski 1738 West Nancy Creek Drive Atlanta, Georgia 30319	Magnetic Storage System for Energy - W. D. Freeston CHAMBLEE HIGH SCHOOL - JUNIOR
Peter McMichael Small 3454 N.W. 12th Avenue Gainesville, Florida 32605	High Capacity Information Storage Systems Using Lasers - T.K. Gaylord (EE) THE UNIVERSITY OF FLORIDA P.K. YONGE LABORATORY SCHOOL - SENIOR
Marlea Alice Smith 249 Laurel Avenue Atlanta, Georgia 30310	Detection and Measurements of Hypo- iodous Acid - H. M. Neumann (Chem) M. T. BLOUNT - SENIOR
Earnest Spears 1790-E W. Clark Avenue Prichard, Alabama 36610	Polymer Degradation: Polyamides - M.E. Sikorski, J.L. Lundberg, W.C. Tincher & W.C. Carter, M. T. BLOUNT - SENIOR
Stephen Samuel Wade 7 Brewster Street Savannah, Georgia 31406	Computer Aided Design of Textiles - M. Konopasek SAVANNAH CHRISTIAN SCHOOL - SENIOR
Everett Darryl Walker P. O. Box 472 Donalsonville, Georgia 31745	Breaking of Sulfur Bonds in Vulcanized Rubber - W. C. Carter SEMINOLE COUNTY HIGH SCHOOL - SENIOR

(*Dropped out of program to work.)

Donna Marie Whelchel
2284 Crestcliff Drive
Tucker, Georgia 30084

Henry Lewis Whisenhunt
3125 Walton Way
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Ronnie Williams
2125 Simpson Road #34-A
Atlanta, Georgia 30314

Tyler Theis Williams
50 Bonnie Lane
Atlanta, Georgia 30328

Calvin Lowe Wilson
130 Loblolly Road
Moultrie, Georgia 31768

Claudia Willyenne Woods
330-Leland Terrace, N.E.
Atlanta, Georgia

Do Suntan Lotions Really Work? -
W. L. Bloom (Adm & Biol)
TUCKER HIGH SCHOOL - SENIOR

A Copper and Nickel Catalyst for En-
gine Exhaust - J. L. Pentecost (Cer. Engrg)
ACADEMY OF RICHMOND COUNTY - JUNIOR

Effects of CO₂ on the Growth of
Plants - W. C. Carter
H. M. TURNER HIGH SCHOOL - SENIOR

Mechanochemistry: Polyamide
Engines - J. L. Lundberg
RIVERWOOD HIGH SCHOOL - SENIOR

Solar Cells: Gallium Arsenide
Schottky Barriers, Preparation
and Testing - E. L. Meeks (EES)
MOULTRIE HIGH SCHOOL - SENIOR

Interactive Graphics -
D. O. Covault (CE) & T.H. Brandon (CE)
J. C. MURPHY HIGH SCHOOL - SENIOR

III. The Program

A. Research

The purpose of the program was to introduce students to research in engineering and science and to help them carry on research of some value. Fifty six (56) student participants worked on fifty six (56) different research problems. (Three students left the program before completing their work.) Thirty seven (37) research advisers from ten schools at Georgia Tech, Aerospace, Ceramic, Civil, Electrical, Nuclear and Textile Engineering and Biology, Chemistry, Physics, and Psychology, from the Engineering Experiment Station and academic administration at Georgia Tech, and from the Fernbank Science Center of the DeKalb County School System helped the

students with their research. One student carried one of his two projects to completion without a research adviser requiring only the help of a machinist (Mr. F.D. Smith).

The diversity of research projects was greater than in past years. Most projects were multidisciplinary. A breakdown of principal disciplines and major subjects, and materials involved is as follows:

<u>Disciplines Involved</u>	<u>Number of Projects</u>	<u>Major Subjects and Materials Involved</u>	<u>Number of Projects</u>
Chemistry	31	Computing	9
Engineering	17	Energy	6
Life Sciences	13	Environment	6
Physics	9	Nuclear science	1
		Polymers	15
		Textiles	13

The emphasis on chemistry and life science reflects the students relating to somewhat familiar disciplines. High school students usually study biology first, chemistry second, and physics last, often in their senior years after participating in an SST program.

We want as great diversity as is possible in research problems among the students. They learn more from each other than from faculty. If the range of research subjects is great, the participants teach each other a wide range of subjects. Some exposure to a wide range of science and engineering is essential if students are to become interested in the fascinating and vital but less known areas of science and engineering. Lack of exposure to

diversity coupled with too early specialization prevents young scientists and engineers from contributing in less known, fertile areas of need in science and engineering. We cannot afford to let the less known areas languish; often these are the areas of likely breakthrough. The well known and spotlighted areas of science and engineering tend to be over-worked. Exposure to diversity should begin early.

Fair to good results were obtained in many of the research projects. Results will be published in years to come as continuing work is completed. For example, one Ph.D. candidate in Textile Engineering who worked in the Georgia Tech SST programs in previous years has three acknowledgements to SSTP participants in his dissertation; participants studies of viscoelasticity of spider fibers and other polyamides with this graduate student contributed significantly to research in this area.

We put the students on their own as far as tending to their research. Of course we encourage them and help them, but we don't lead them by the hand. Some students don't accomplish as much as they should, but almost all who aren't as dilligent as they should be learn from this mistake. In our program, participants make part of that change from structured program, dependence upon close supervision and being pushed, and home to diversity of opportunity, independence and need for self-motivation, and living in a university; most respond and perform well.

The names of students, research problems and research advisers is given on pages 7 to 12.

Research advisers for student participants were as follows

<u>Name</u>	<u>Degree</u>	<u>Position</u>	<u>School or Org.</u>	<u>Speciality</u>
F. Benzel	Ph.D (Cer.E)	Assoc.Prof.	Ceramic Engrg.	Materials & process
L. Bloom	M.D.	Prof.& Assoc. VP	Biology & Adm.	Physiology
H. Brandon	B.S. (C.E.)	Grad.Res.Asst.	Civil Engrg.	Computer graphics
C. Carter	Ph.D (Chem)	Professor	Textile Engrg.	Textile & polymer
T. Chapman	Ph.D (Cer.E)	Professor	Ceramic Engrg.	Glasses & crystals
K. Cochran	Ph.D (Cer.E)	Asst. Prof.	Ceramic Engrg.	Glazes & crystallog
Coff	B.S. (Text)	Grad.Res.Asst.	Textile Engrg.	Computers & textile processing
L. Cook	Ph.D (Chem)	Asst. Prof.	Textile Engrg.	Textile & polymer
O. Covault	Ph.D (C.E.)	Professor	Civil Engrg.	Transportation
K. Davenport	Ph.D (Psych)	Professor	Psychology	Animal behavior
Domeshek		Undergrad.Res. Asst.	Textile Engrg.	Synthetic chemist
G. Eichholz	Ph.D (phys)	Regents Professor	Nuclear Engrg.	Nuclear sciences
D. Freeston, Jr.	Ph.D (M.E.)	Professor & Director	Textile Engrg.	Mechanics
K. Gaylord	Ph.D (E.E.)	Assoc. Prof.	Electrical Engrg.	Optics
R. Gentry	Ph.D (Mgmt)	Assoc. Prof.	Textile Engrg.	Fiber properties
P. Giddens	Ph.D (A.E.)	Assoc. Prof.	Aerospace Engrg.	Bioengrg.
Heeps	BA (Botany)	Chmn., Horticulture	Fernbank Sci.Center	Botannical garden
Y. Ko	M.S. (Chem)	Grad.Res.Asst.	Textile Engrg.	Polymer phys. chem
Konopasek	M.S. (Phys)	Assoc. Prof.	Textile Engrg.	Mechanics & compu
R. Livesay	Ph.D (Met)	Sr.Res.Sci.	Engrg.Expt.Sta.	Mech.&metals phys
L. Lundberg	Ph.D (Chem)	Callaway Prof.	Textile Engrg.	Polymer science
W. May	Ph.D (Chem)	Asst. Prof.	Chemistry	Biochemistry
L. Meeks	Ph.D (Phys)	Sr.Res.Sci.	Engrg.Expt.Sta.	Semiconductors
M. Neumann	Ph.D (Chem)	Professor	Chemistry	Inorganic chem.
H. Olson	Ph.D (Phys)	Assoc. Prof.	Textile Engrg.	Mechanics & knitt
C. O'Shea	Ph.D (Phys)	Assoc. Prof.	Physics	Optics
L. Pentecost	Ph.D (Cer.E)	Prof. & Director	Ceramic Engrg.	Ceramic mtl.s.engr
S. Phillips	B.S. (Chem)	Grad.Res.Asst.	Chemistry	Biochemistry
J.R. Robertson, Jr.	B.S. (Text.Ch)	Grad.Res.Asst.	Textile Engrg.	Textile chem.
S. Sen	B.S. (Text.Eng)	Grad.Res.Asst.	Textile Engrg.	Fabric structures
M.E. Sikorski	M.S. (Phys)	Res. Engr.	Textile Engrg.	Mechanics
J.A. Stanfield	Ph.D (Chem)	Professor	Chemistry	Organic chema.
A.S. Tata	B.S. (Text.Ch)	Grad.Res.Asst.	Textile Engrg.	Textile chem.
A. Tayebi	Sc.D (M.E.)	Asst. Prof.	Textile Engrg.	Mech. & processin
W.C. Tincher	Ph.D (Chem)	Professor	Textile Engrg.	Polymer & textile
E.K. Yeagers	Ph.D (Biol.)	Assoc. Prof.	Biology	Microorganisms
R.A. Young	Ph.D (Phys)	Professor	Physics	Crystallography

Of this group of thirty-seven (37) research advisers, thirteen (13) are senior faculty members (professors), twelve (12) are assistant or associate professors, three are senior scientists, one is a research engineer, seven are graduate research assistants, and one is an undergraduate research assistant. All members of the academic community should work with the participants of our SST program; each has special talents and advantages of experience, perspective, credibility, empathy, enthusiasm, communication, etc. which must be used. Research advisers in our 1976 program ranged in age from 19 to about sixty. Unfortunately, we had no women and no blacks in this group; though natives of Asia, Africa, and Europe are included.

We have found senior faculty involvement is essential to the success of our SST program. Without Professors Carter, Freeston and Tincher of the School of Textile Engineering the program could not function. These together with Dr. Walter Bloom, Associate Vice-president for Academic Affairs and Professor of Biology, Dr. Geoffrey Eichholz, Regents' Professor of Nuclear Engineering, Professors Henry Neumann and James Stanfield of the School of Chemistry and Professor R. A. Young of the School of Physics provided some of the most interesting and rewarding research opportunities for our participants. If senior faculty care and participate, SST participants will return as undergraduate students.

At least five of the participants are continuing work on their problems. These include Roderick Gay (Atlanta), Alan Roeder (Dunedin, Florida), Tim Rydel (Pittsburgh), Mark Sikorski (Atlanta), and Tyler Williams (Atlanta). Of these three will enter competitions.

B. Seminar & Demonstrations Program

Seminars and demonstrations followed closely those outlined in the proposal. Forty two seminars in science, engineering, and mathematics centered around polymer, fiber, and textile science and engineering were presented by members of the faculty of the school of textile engineering. Other seminars included one in counselling, two in English composition, one on computing systems, and one in laboratory safety. Seminars and demonstrations accounted for 60 to 65 hours of scheduled time. In the last week of the program, three seminars were devoted to student participants reports on their research. Faculty members and research advisers sat in for reports in which they were involved or interested. Participants were required to attend these seminars and seminars which are listed in Appendix II, pages 42 to 44.

Seminar leaders and demonstrators were the following eleven faculty members and one staff member of the School of Textile Engineering and Dr. Barbara Winship of the Counselling Center and Professor James Bynum of the English Department.

<u>Name</u>	<u>Degree</u>	<u>Position</u>	<u>Specialty</u>
C. Anderson	B.S. (Text)	Asst. to the Director	Counselling incoming students
W.C. Boteler	M.S. (M.E.)	Professor	Mechanical & textile eng
D.R. Brookstein	Sc.D (M.E.)	Asst. Professor	Textile & mechanical eng
J.J. Bynum	Ph.D (Engl.)	Assoc. Professor & Asst. Dean, Grad.Div.	Composition, Am. literat
W.C. Carter	Ph.D (Chem)	Professor	Polymer & textile chem.
F.L. Cook	Ph.D (Chem)	Asst. Professor	Organic & textile chem.
W.D. Freeston, Jr.	Ph.D (M.E.)	Prof. & Director Textile Engrg.	Mechanics & textile engr
D.R. Gentry	Ph.D (Mgmt.)	Associate Professor	Fiber science & managem
M. Konopasek	Ph.D (Phys)	Assoc. Prof.	Mechanics & computing
J.L. Lundberg	Ph.D (Chem)	Callaway Prof.	Polymer science
L.H. Olson	Ph.D (Phys)	Assoc. Prof.	Textile & fiber physics
A. Tayebi	Sc.D (M.E.)	Asst. Professor	Mechanics & textile engr
W.C. Tincher	Ph.D (Chem)	Professor	Polymer & textile chem.
Barbara J. Winship	Ph.D (Psych)	Asst. Dir., Counselling Cntr.	Counselling

C. Colloquia

Eight (8) colloquia with speakers from other schools or from off campus were presented. Participants were expected to attend colloquia. About twelve hours were devoted to colloquia. Speakers, affiliations, and subjects were as follows:

"Ceramics and Glasses", Professors A.T. Chapman and J. K. Cochran, School of Ceramic Engineering, Georgia Tech.

"Engineering Science and Mechanics", Professor Milton Raville, Director, School of Engineering Science and Mechanics, Georgia Tech.

"Animal Behavior", Professor R. K. Davenport, School of Psychology, Georgia Tech, and Staff Member, Yerkes Primate Laboratory, Atlanta

"Fiber Optics" (with demonstrations including transmission), Dr. George Yanizeski, Bell Laboratories, Atlanta.

"Nuclear Engineering", Professor J. N. Davidson, School of Nuclear Engineering, Georgia Tech.

"Food: Needs and Supplies; the White House Fellows Program", Some Observations from Washington, etc.", Dr. James E. Bostic, Jr., Deputy Assistant Secretary of Agriculture, Washington, D. C.

"Interpersonal Relationship" and "Psychology in a Technological Institute", Professor Ethel Jo Baker, School of Psychology, Georgia Tech.

"Nonlinear Waves: Deformation in Tires, Hydroplaning, and Thread-line Instabilities in Fiber Spinning - with Motion Pictures", Professor W. F. Ames, School of Mathematics, Georgia Tech.

D. English Clinic

Professor James Bynum of Georgia Tech's English Department led two short seminars on English. In these he explored with the participants our need for good command and use of written and spoken English and drew from them some of their feelings about their study of English. At the first seminar on the third day of the program, he asked each participant to write a short theme describing a situation, experience, place, or thing well known to and with real meaning for him or her. Professor Bynum read

and analyzed these themes writing on each his estimates of the writing, suggestions as to how each student could improve his or her writing, and some words of encouragement. Professor Bynum returned these at a second seminar (late in the program) with further discussion of written communication. Several of the members of the Georgia Tech faculty are convinced that English is the most important subject in all curricula at Georgia Tech. We continually encourage our students to improve their use of their language. We have extended this to our SST program.

E. Computing Seminars

Mrs. Cheryl Allen, Systems Analyst in the Office of Computer Services at Georgia Tech, arranged guided tours of computing facilities for each of the participants (taken in small groups). She conducted five (5) two hour sessions on computing, chiefly use of the Control Data Corporation Cyber '74" system, the Univac 1108, PDP 8 computers, and the "Calcomp" plotter. Attendance at these computer seminars was voluntary. In addition, Mrs. Allen and other members of the Georgia Tech Computer Center's staff served as willing programming counselors to introduce our SSTP participants to computing. All students were provided with necessary account numbers, identification, etc. so that they could use the computing facilities at Georgia Tech. About one third of the students did use the computers; a few became adept at computing and playing computer games.

Professor Milos Konopasek and Mr. Craig Anderson introduced SSTP participants to the remote access terminals to the big computer on campus and to the small computers in the School of Textile Engineering. Professor Konopasek offered as much time and help as students desired in learning to use his question and answer system and to learn programming and use of

the large "Cyber-74" computer. Mr. Howard Coff assisted in this teaching of computing.

F. Counseling

Dr. Barbara Winship of the Student Counseling Center at Georgia Tech met with the students the second day of the program. A few days later the participants visited the Counseling Center; Mr. Thomas Parker met with and spoke to them. In this way, participants became aware of some of the help available from these dedicated and able psychologists. In their discussions, Mr. Parker and Dr. Winship discussed the transition from home to college life the participants were experiencing and would face again in a little over a year, some of the ways to develop effective study habits, and how the participants might help themselves to enrich their experience in our SST program. Mr. Parker was particularly helpful in communicating with some of the minority group participants who were a bit overwhelmed by Tech, the program, and meeting and competing with many different, able young people.

G. Special Seminars on Advanced Subjects and Seminars Requested by Students

Ten special seminars on mechanics, thermodynamics, quantum mechanics, statistical thermodynamics, and spectroscopy were offered with attendance voluntary. From eight to seventeen students participated. Dates and subjects were:

1. "Newton's Mechanics & Conservation of Energy" - June 15, 1976
2. "The First Postulate of Thermodynamics" - June 17, 1976
3. "More on the 'First Law' of Thermodynamics" - June 22, 1976
4. "The Second Postulate - Carnot's Cycle" - June 24, 1976

5. "More on Efficiency, Energy Crunch, Etc.- Entropy" - June 29, 1976
6. "Work Free Energy & Equilibria" - July 1, 1976
7. "Planck's Quantum Mechanics: $S = k \ln W$ " - July 13, 1976
8. "More of Planck's QM" - July 15, 1976
9. "Wave Mechanics: Plausibility and Application" - July 20, 1976
10. "Statistical Thermodynamics: $S = k \ln W$ " - July 22, 1976

J. L. Lundberg was seminar leader. Participants were provided with detailed notes.

At the request of the students, seminars on mathematics were offered. Voluntary attendance ranged from one to twenty plus depending on time and press of work. These seminars were:

- "Calculus", W. D. Freeston, July 6, 1976
- "Calculus", D. B. Brookstein, July 8, 1976
- "Calculus", J. L. Lundberg, July 13, 1976
- "Algebra", J. L. Lundberg, July 14, 1976
- "Algebra", J. L. Lundberg, July 15, 1976
- "Algebra, 'Trig' & Calculus", J. L. Lundberg, July 19, 1976
- "Math", J. L. Lundberg, July 21, 1976
- "Math", J. L. Lundberg, July 22, 1976
- "Math", J. L. Lundberg, July 26, 1976
- "Math", J. L. Lundberg, July 28, 1976
- "Math", J. L. Lundberg, July 29, 1976

Students became aware of their deficiencies in preparing for calculus. A number went home with texts to study. We emphasized the need for a good

knowledge of algebra to permit learning of calculus.

H. Field Trips & Visits

On July 9, 1976, all participants visited the Fernbank Science Center where they saw and heard a special demonstration of the planetarium by Mr. Julius Staal, Planetarium Chairman. They participated in a demonstration of and observation using telescopes in the observatory led by Mr. John Burgess, Planetarium Lecturer. SSTP participants enjoyed the Center's nature walks and displays and seeing electron microscopy applied in biology. The Fernbank Science Center is a department of the Division of Instruction of the DeKalb County School System.

We visited Callaway Gardens at Pine Mountain, Georgia, on Saturday, July 24, 1976. Dr. R. A. Pedigo, Director of the Education Department of Callaway Gardens, introduced students to the gardens by slide show and short lecture. He then conducted an extensive tour of the gardens with discussions and questions. A few of the students really appreciated the beautiful reclamation of worn-out cotton land and the fine developments in applied botany exemplified by Callaway Gardens.

Our SSTP students visited the nylon manufacturing plant of the American Enka Company at Central, South Carolina, on July 27, 1976. Here they learned about and saw the polymerization of caprolactam to nylon 6; the purification of nylon 6; fiber spinning, drawing, and texturing; laboratory testing and fabric and carpet making, dyeing, and evaluation. On the same trip they visited the Duke Power Company's Oconee Station, a nuclear - hydroelectric complex with three reactors and steam generators, two lakes at different

levels, and water conduits and generator and pumping systems. We were on the power house floor when two of three mammoth generators were delivering about $1.8 \cdot 10^9$ watts. Here we gained some appreciation of how much energy we use and to what extremes we must go to satisfy our needs.

On the Georgia Tech campus, all students visited schools, centers, and facilities as follows:

<u>Date</u>	<u>Site</u>	<u>Hosts</u>
June 14	School of Electrical Engineering	- Professor Thomas M. White
June 14	School of Chemistry	- Professor J.A. Bertrand, Director, and Professor J.A. Stanfield, Assistant Director
June 15	Georgia Tech Library	- Professor Frances Kaiser, Librarian
June 15	Computer Center	- Cheryl Allen, Systems Analyst
June 15	School of Textile Engineering Labs.	- Craig Anderson, Assistant to the Director
June 16	Student Center for ID Cards	-
June 16	School of Ceramic Engineering	- Prof. J.L. Pentecost, Director, and Professor J.F. Benzel
June 16	Georgia Tech Nuclear Reactor	- Professor Monte Davis
June 17	School of Physics	- V.P. Mallette, Research Scientist
June 17	School of Civil Engineering	- Professor C.S. Martin
June 18	Engineering Experiment Station	- J.L. Brown, J.A. Donavan, and E.L. Meeks, Senior Scientists
June 21	- Counselling Center	- T.A. Parker, Counselor

I. Science Movies

Motion pictures on science and engineering were shown four nights weekly in the first three weeks of the program. Attendance was optional.

A list of movies shown is given in Appendix III.

J. Recreational and Group Activities

SSTP participants enjoyed thirteen (13) recreational and group activities in the 48 days from Sunday, June 15th, through Friday, August first. Average intervals between activities was three days; the longest interval was seven days. Teen aged young people need and want both planned, group recreation and unstructured, unplanned activities. Campus recreation facilities and teen-age creativity combine to provide sufficient of the latter. Also a number of the students attended concerts of the Atlanta Symphony Orchestra whose home is close to Tech. Motion pictures are shown on campus Friday evenings during the summer; on Saturdays when no group activities were planned, participants were taken to theaters of their choice in Atlanta. Mr. Craig Anderson and the faculty tried to provide sufficient and varied recreational group activity; most students wanted more such activity. No funds provided by the Foundation can be or were used in any way to support recreational or group activities. A listing of these activities is given in Appendix IV.

K. Communication

Communication gaps did exist in our program; we simply do not listen to one another. To maximize communication we used the following channels; 1. Weekly programs (schedules) were provided to each student. 2. Orientation and question and answer sessions were held by faculty members, Mr. Craig Anderson, and student dormitory counselors, Miss Rebecca Byrd and Mr. Kenneston Carr. 3. "Problems sessions" conducted by the program director. 4. Meetings among SSTP participants, Georgia Tech students, faculty, staff, and participants.

in our past SST programs in the lobby of the Textile Engineering Building.

5. Visits by Mr. Anderson and faculty members to dormitories. 6. Faculty members and SSTP participants eating together at lunch and supper. 7. Faculty members keeping open the doors to their offices and visiting laboratories to talk to and help participants. 8. Keeping contact with Dr. Barbara Winship and Mr. Tom Parker in the Counselling Center. A few students would communicate with these counselors but not other Tech personnel.

IV. Results of the Program: Evaluation

A. General

This 1976 SST program was our fourth, annual program at Georgia Tech. One participant from our first program who came to Tech has graduated; others are sophomores to seniors. Those from the second program are freshmen, sophomores, and juniors. Participants in the third program are freshmen and sophomores. We have observed closely the performance of these students at Tech; they have done well (GPA from 2.2 to 4.0 out of 4.0). A few have done excellent work in undergraduate research. Based upon their performance to date and upon past participants statements we believe that our 1973, 1974, and 1975 programs were successful and that our 1976 program will have served as well in developing science and engineering students. One participant in the 1976 program is in school at Tech as an early entrant and should come close to an A average in his first quarter.

B. Assessment of Research Results in the 1976 Program

The program director graded the research activity of each of the participants for this report. Grades are based on: 1. students' research reports, 2. estimates of performance by research advisers, 3. observations of and conversations with participants in the laboratories, and 4. general impressions

by faculty members, other students' research advisers and the program director. Estimates of research performance compared to estimates of abilities of applicants (as given in Table I , page 6) are given in Table II. Estimates are grouped for participants with good to excellent opportunity and encouragement to study science, those with limited opportunity and/or encouragement, and for all participants. (The grade, "Good", with grade point 2.0 (C) is characteristic of abilities and work of students whom we would welcome to Georgia Tech as students of engineering, science or mathematics.)

Table II
Comparison of Estimates of Students Abilities with Estimates of
Their Research Performance, 1976 SST Program

Group	Estimated Potential as Applicants	No. of Students	Superior A=4	Excellent B=3	Good C=2	Fair D=1	Poor F=0	Average GPR
Good to Excellent Opportunity	Gifted (A=4)	6	2	4	0	0	0	3.
	Very Good (B=3)	6	0	3	3	0	0	2.
	Good (C=2)	6	2	0	4	0	0	2.
	Fair (D=1)	4		2	0	0	0	2.
	Poor (F=0)	1	0	0	1	2	0	2.
	Average/Total	2.5/23	4	9	8	2	0	2.
Limited Opportunity	Gifted (A=4)	2	0	1	1	0	0	2.
	Very Good (B=3)	6	2	3	1	0	0	3.
	Good (C=2)	5	2	1	2	0	0	3.
	Fair (D=1)	11	0	4	6	0	1	2.
	Poor (F=0)	6	0	1	4	1	0	2.
	Average/Total	1.6/30	4	10	14	1	1	2.
All Students	Gifted	8	2	5	1	0	0	3.
	Very Good	12	2	6	4	0	0	2.
	Good	11	4	1	6	0	0	2.
	Fair	15	0	6	6	2	1	2.
	Poor	7	0	1	5	1	0	2.
	Average/Total	2.0/53	8	19	22	3	1	2.

Most students whose potential was estimated as poor (F=0) to fair (D=1) performed beyond expectations. On the average students with limited opportunity and/or encouragement in science did better in their research than we expected, performance GPR 2.5 compared to expectations GPR 1.6. Students with good to excellent opportunity performed (GPR 2.7) as expected (GPR 2.5). One participant did poor work (F=0) and three were only fair (D=1) in their research. Each year we become more critical in grading participants' performance because students show us how well they can do in their research; each year participants set higher standards for those who follow. We believe that we made no overestimates. We try to judge SSTP participants on the same basis we try to measure research performance of Georgia Tech undergraduates in special problems courses. Estimates of potential are the same as those for entering freshmen; we make no allowance for difference in age and years of schooling.

Comparison of estimates of ability and performance supports our belief that the necessary and almost sufficient condition for success is desire; ability as measured by tests and grades is secondary. Of course, class rank often correlates with desire. Based on exam scores at least four participants should not consider college. Of these three did good work (C=2) and one fair work (D=1) in their research. Two of the four are in the top one to three percent of their high school classes. Three others with PSAT scores below 80 did better than good (C=2) work in their research; these are close to the tops of their respective classes.

Our estimates of average potential of and performance by participants in the last three SST programs at Georgia Tech are:

<u>Year</u>	<u>Number of Participants</u>	<u>Estimated Potential</u>	<u>Estimated Performance</u>
1974		2.5	2.5
1975	37	1.8	2.6
1976	53	2.0	2.6

In 1975 we had fewer "gifted" or "very good" prospects than in 1974. We had more in number and a greater fraction in these categories in 1976. Faculty and staff consensus is that our 1976 group was the best yet and that the 1975 group was better than the 1974 group. In 1976 we had few "gifted", lazy participants.

The participants in the 1976 SST program profitted from it. Almost all worked at least reasonably hard; none "goofed off" completely. In this respect, the 1976 group was as good or better than the 1975 group and much better than the 1974 group. Almost all participants in our 1976 program can "make it" in college; they are good prospects. Most of the participants can do well in engineering or science.

C. Students' Evaluation of the Program

Again in 1976, students' evaluations of the Georgia Tech SSP program were more favorable than they should be. To date the twelve (12) responses to the questionnaire in Appendix V (with numerical results) permit us to conclude:

1. Forty five (45) seminars may be too many.

2. Students are programmed for 50 minute classes; 1 1/2 hour seminars are long for them, at least at first.
3. Freshmen to junior level in college is about the right level for seminars.
4. Seminars of greatest interest to students ranged over a variety of subjects from color and dyes and fabric formation to thermodynamics.
5. Subjects of least interest included dyes, fabric formation and chemistry. Similar subjects by the same seminar leaders appear in both most and least interesting categories; this may be due to the diversity of interests of students in the program.
6. Most participants want more "outside" speakers, cost and logistics not withstanding.
7. Some students would welcome more material in seminars; an equal number want less.
8. We could offer more different research problems to satisfy diverse interests of participants.
9. Faculty assistance in research was better than good; few found faculty less than helpful.
10. Most students found procuring materials and instruments to be easy; for a few this was hard.
11. More time should be devoted to research.
12. More time should be devoted to familiarizing participants with Tech's research and recreational facilities. Such help was available to all on individual or small group basis.

13. Students like organized outings; time, financial, resources, and stamina of faculty and staff limit these.
14. The trip to Six Flags Over Georgia was the favorite outing. Visiting the High Museum of Art was least favored.
15. Students want more free time.
16. Research is a favored activity, at least in retrospect. Meeting people ranks high.
17. Most students liked our SST program as it was run in 1976, or with a few changes.
18. We should continue to emphasize research.

Comments from a parent and a teacher are included in Appendix VI.

D. Good Points of the Program

Research was our chief activity; the fun of research and satisfaction from accomplishment were the most cited "good things" in the program. Most participants got real results in their work. A few projects with particularly significant results are:

1. Mark Bruemmer, "X-ray Diffraction Studies of Structures".
2. Pearl Casne, "Analysis of Essential Oils from Eucalyptus and Caraway".
3. Gordon Davis, "Resistance of Bacillus Cereus to Tetracycline".
4. Maureen Dobel, "Solubility of Ferricinium in Acetone-Water Solutions".
5. Mark Long, "Meristemming - Clonal Propagation of Orchids".
6. Catherine Longtin, "Stability of Reactive Dyes to Bleaching".

(Dr. W. C. Carter considers Miss Longtin's work to be as good or better than any research or project work by any undergraduate students with whom he has worked in eight years at Georgia Tech.)

7. Tim Rydel, "Effects of Hydrolysis on the Amide Content, Dyeability, and Strength of Nylon 66".
8. Peter Small, "High Capacity Information Storage Systems Using Lasers".

These students were rated excellent (A=4) in performance. Of these, two were estimated to be "gifted" (A=4) with great potential, two as "very good" (B=3), and four as "good" (C=2). Four of these participants came from schools with limited opportunity to study science.

Each year we can offer a greater diversity of research problems and find research advisers for a wider range of research suggested by participants. This is thanks to enthusiastic participation by colleagues in other schools and centers at Georgia Tech. With greater diversity of research problems, special seminars in advanced chemistry and physics, visiting colloquium speakers, and additions to variety of material presented in the seminar program, our program has become more diverse (interdisciplinary or multidisciplinary in current jargon). We find that students learn chemistry and physics at least as easily using macromolecular systems with reference state a partially ordered composite structure as using the usual small molecule compounds with the ideal gas and sodium chloride crystal as reference states.

Colloquia with outside speakers were well received. For the fourth year, Dr. James E. Bostic, Deputy Assistant Secretary of Agriculture, came to visit and lead a discussion in our SST program. Dr. Bostic is a favorite with the students; each year they quiz him for about two hours on a wide variety of subjects.

Our colloquium speakers included one woman and one minority member. Judging from students' reactions and comments, including at least one minority member, who communicates well with people, is essential. The same is probably true for including career women in the program. In 1976, response by the girls was more subdued than the reaction by minority members.

Dr. James Bynum's contributions in helping participants appreciate the importance of English and to write better were needed and appreciated. By the second week participants knew that English is their most important subject.

More students used the computers this year than in previous years. Serious, useful computing increased. Twelve or thirteen participants used computers extensively in their research. Mrs. Cheryl Allen of the Computer Center and Professor Milos Konopasek of the School of Textile Engineering were more than effective in introducing participants to computing.

Special seminars on Newton's mechanics, thermodynamics, quantum mechanics and statistical thermodynamics were well received. From ten to fifteen students participated. High school students seem to understand Max Planck quite well; we used his 1901 paper as text material. Students particularly appreciated the eleven special seminars on mathematics which they requested.

Nature knows no disciplines; she needs no interdisciplines. Introducing students to science, engineering and math in this manner is easy. Comments from past participants about this and the ease with which 1976 participants learned give credence to the thesis that teaching math, science

and engineering together with many examples familiar to the students make easier the learning and give relevance to otherwise abstract ideas. Too often we forget that nature and students do not require and the latter do not appreciate dividing studies into disciplines; rather, these artificial divisions hamper learning.

Many students are sheltered to the extent that they haven't been in a factory, for example. Therefore, the visit to the nylon plant and the nuclear power station is a real "eye opener".

Miss Rebecca Byrd, counselor for girls in our 1974 SST program, a junior majoring in textile chemistry, and employed every other quarter by the Monsanto Textiles Company at Decatur, Alabama, in the cooperative plan, was the girls' counselor in 1976. Her counterpart for the boys was Mr. Kenneston Carr, 1974 SSTP participant, early entrant in 1974, junior majoring in textile engineering; Mr. Carr was the boys' counselor in our 1975 SST program. These fine, bright, scholarly and active young people contributed immeasurably to the 1976 program. In her undergraduate research, Rebecca Byrd worked on studies leading to quantitative measurements of "hand" of fibers and yarn in the summer quarter of 1976. Students learned much from her in her research - patience, care, attention to detail, and the necessity of doing their best.

Students adjusted well to campus life. The program helped many to cope with being away from home and living on campus without the penalty of failure. A few of our participants probably would fail in college without this experience.

E. Problems

Perhaps our most difficult task is to help SSTP students to develop some feeling for the nature of science and engineering and for the diversity of opportunities they will enjoy in college and after. Most students know only structured, discipline oriented, over-organized, and dogmatic secondary schools, which do not prepare them for college. Most SSTP participants have little feel for the experimental method and deductive reasoning, experimental technique, and little propensity to doubt, question, and test what they see, read, and hear. Therefore, if participants are to have any meaningful experience in SSTP research problems, unjustifiably much faculty time is required for much one on one tutoring and help. We believe that we of the School of Textile Engineering and our colleagues in other Schools at Georgia Tech have made that commitment of time. The 1976 participants were more able, inquiring, and productive than those in our 1974 and 1975 SST program.

Again in 1976, we had no racial problems. SSTP participants developed good rapport and real affection for one another. One of the counselors is a minority member.

F. Changes in Future Programs

In future programs we shall continue to increase the diversity of research problems available. Further, we shall continue to encourage participants to suggest their own problems. Because of the diversity of ongoing research at Georgia Tech and the willingness of investigators to add research students to their groups or to branch out into new areas of investigation, we can find research advisors and facilities for most problems suggested by participants. Eleven (11) participants suggested

their own projects and worked on them in our 1976 program. Two participants found their own research advisers, one at Georgia Tech and one at the Fernbank Science Center.

We had more projects in "go" condition in 1976 than in 1975. More participants found equipment and materials easier to obtain in 1976 than in 1975. We shall try to continue this improvement in 1977.

In 1977, we shall broaden our program a bit. At the junior-senior level in high school students should be exposed to the diversity and breadth of science and engineering so that they become aware of and perhaps interested in areas of science and engineering of which they may remain ignorant. Students can't study in fields of which they are unaware. The diversity of material in seminars will be increased some.

We have emphasized that students need not worry about deciding on major fields of study. The constant pressure from teachers, counselors, college admissions officers, and parents to elect majors bothers most students who really don't know what they want to study. Therefore, we have urged students to be undecided engineering or science majors and to take math, chemistry, and physics suitable for majors in each of these disciplines and the best English courses on campus. Further, we stress that as long as they take the "high road", choice of major is not as important as deans and registrars would have us believe. Taking the good courses suitable for majors in each discipline keeps options open. Further, we suggest that students group their elective courses and take what is in effect a second major. We try to orient our SSTP participants in this way and to ween them from their excessive cleaving to disciplines, curricula, etc

G. Effects of the Program

The effect on participants was to increase in each an appreciation of science and engineering and an eagerness for real study at the university level. The SST program is excellent for recruiting good students to good schools. Seeing science and engineering first hand at Georgia Tech convinced a few undecided students that they must go to college. It has caused a few students with vague notions about studying some more estoteric subjects to consider science and engineering including polymer, fiber, and textile science and engineering.

Another effect of the program on some of the participants was to help them to "aim higher", at better colleges and universities in more difficult curricula. This broadening of interests and horizons and the realization that they can "make it" in the better schools means that several of the fifty-three (53) students, who participated in the whole program, probably will register in science or engineering curricula in strong schools instead of beginning in less demanding curricula in lesser schools.

At least three of the students are continuing to work on their research problems.

Students in our 1976 program developed the real friendship for one another that was obvious in the 1974 and 1975 groups. The 1976 group enjoyed being together, enough that they will come to Georgia Tech on January 13-16, 1977, for a reunion. This regard for one another and communication among most students bridged differences in economic status,

background, preparation, sex, and race. The participants learned more from each other than from faculty and staff.

The principal effect of the 1973,-74,-75, and -76 programs on the School of Textile Engineering is that we started or pushed forward some research programs which would have languished without this spur. Of the problems worked on by students in 1976, at least twenty-five are being continued; of these at least eleven received major impetus from students working on the problem.

Another effect upon our school was to further acquaint us with and make us much more sensitive to hopes, needs, thinking, problems, strengths, and weaknesses of young people who are likely candidates for science and engineering. We learned how to reach several of these people through their schools, families, friends, etc. The School of Textile Engineering will continue to increase its contacts with potential students of science by visiting more schools, giving more seminars and demonstrations in schools, helping more teachers and students with research projects and demonstrations, entertaining more visiting students and teachers at Georgia Tech, etc.

As a direct result of our SST programs, the Atlanta City Schools will hold their annual Science Congress in the School of Textile Engineering on February 16-18, 1977. More than two hundred high school students will demonstrate their research and project work in science and mathematics.

H. Follow-up on the program

Follow-up on the program has begun. All participants in the 1976

program have received at least two letters from faculty and staff of the School of Textile Engineering. All have received a questionnaire requesting participants' reactions to the program; twelve (12) participants have responded to date. All have received a group picture in color.

Georgia Tech faculty members are helping three of the participants to continue working on their research programs.

A demonstration kit showing polymerization of nylon, rubber, elasticity, drawing and texturing of fibers, fabric flammability, dyeing and finishing of fabrics will be distributed in January, 1977, to each of the high schools from which participants came. The student participants in SSTP will use these to demonstrate to fellow students some of what they have learned about polymers, fibers, and textiles.

The student participants, teachers who can come, and Georgia Tech staff and faculty will come to campus as guests of the faculty on January 13-16, 1977, for a reunion, recreation, and fellowship. At that time and in subsequent letters we shall learn the career plans of participants. We shall do our best to keep in touch with participants until they have graduated from colleges or become permanently employed after leaving school.

V. Suggested Improvements in the National Student Science Training Programs

This program is excellent; it reaches young people at the right time to save a few for science in spite of the thrust of secondary education away from science and other difficult disciplines. Further, our

SST program makes some students aware of the diversity of opportunities for study in science and engineering and that many paths lead to similar goals. Students have to know the existence of different curricula and study programs before they come to college if they are to consider enrolling in them.

The Foundation's staff knows better than we the two biggest improvements which can be made in the program. These are:

- 1) adequate funding for 200 plus individual programs,
- 2) announcing grants before September first of each year to give adequate time for publicizing programs and seeking additional funds for the following summer, and
- 3) enticing high school teachers to participate in the program.

Acknowledgements

Dr. Amad Tayebi, Assistant Professor of Textile Engineering, served as associate director of our 1976 SST program. His contributions in research, seminars, and administering the program were indispensable to the operation and success of the program.

Mr. Craig Anderson, Assistant to the Director of the School of Textile Engineering, cared for most of the housekeeping, travel, and activities arrangements for the program. He also served as an extra, almost full time counselor for student participants. His contributions to the program made the program go; his easy, friendly empathy facilitated communication with participants.

Dr. W. Denney Freeston, Jr., Professor and Director of the School of Textile Engineering, worked in the SST program days, nights, and weekends as research adviser, seminar leader, counselor, chaperone, chauffeur, mechanic, and administrative supporter. His enthusiastic participation and encouragement insured success of our 1976 SST program.

The many members of the faculty, staff, and students of Georgia Tech listed on pages 15, 17, 18, 22, 23, and 33 plus an equal number whose names don't appear and friends at Fernbank Science Center, American Enka Company, Duke Power Company, and Callaway Gardens made our 1976 SST program a success.

Our friends in industry, who contributed \$4,700, made possible field trips, recreation for participants, and the participation of most of the extra dozen or more students in our 1976 program.

Appendix I - Brochure

Appendix II - Seminars & Demonstrations

1. "Our World of Giant Molecules" - J. L. Lundberg
2. "Stress-Strain Behavior" - W. D. Freeston
3. "Concepts of Equilibrium" - A. Tayebi
4. "Near Equilibrium Kinetics" - J. L. Lundberg
5. "Viscoelasticity of Polymers" - A. Tayebi
6. "Molecular Size" - J. L. Lundberg
7. "Periodicity & Chemical Bonding" - J. L. Lundberg
8. "Carbon to Carbon Bonding & Vinyl Polymerization" - J. L. Lundberg
9. "Vinyl Polymerization & Copolymerization" - J. L. Lundberg
10. "Chemical Bonding: Covalent & Ionic Bonds, Polarity, Acidity, etc." - W. C. Carter
11. "Chemical Bonding: SiO_2 & Other Oxides, Salts, Inorganic Compounds, Metals, etc." - W. C. Tincher
12. "Chemical Bonding: Carbon to Oxygen - Chemistry of Ethers, Alcohols, Acids, Aldehydes, Ketones, etc." - W. C. Tincher
13. "Chemical Bonding: Carbon to Nitrogen - Chemistry of NH_3 Amines, Amides, Nitriles, etc." - W. C. Tincher
14. "Polyamides: Nylons & Proteins. Polyesters: Polyethyleneterephthalate & DNA Polyethers: Polymethyleneoxide & Starch & Cellulose" - W. C. Carter
15. "Polyethers: Cellulose and Starch. Polyesters: PET, DNA, RNA, etc." - W. C. Carter
16. "Kinetics & Differential Calculus" - J. L. Lundberg
17. "Rates of Chemical Reactions Including Chain Reactions" - F. L. Cook
18. "Molecular Weights, Average Molecular Weights & Molecular Weight Distributions" - J. L. Lundberg
19. "Averages, Summations, Integration, Areas, Moments, etc." - J. L. Lundberg

20. "Polymers & States of Matter - Crystalline, Glassy, Rubbery Structures & Behavior" - A. Tayebi
21. "Glassy Polymers" - J. L. Lundberg
22. "Theory of Probability" - D. R. Gentry
23. "Fabrication Processes: Getting Polymers into Useful Forms" - W. C. Tincher
24. "Structure and Morphology of Polymers" - A. Tayebi
25. "Statistical Analysis" - D. R. Gentry
26. "Rubber Elasticity" - L. H. Olson
27. "High Modulus, High Tenacity Fibers" - F. L. Cook
28. "The Composite Structure Model of Polymers" - J. L. Lundberg
29. "Dyes and Dyeing" - W. C. Carter
30. "Fiber Drawing & Texturing" - A. Tayebi
31. "The Incredible Journey to a Dye Site" - F. L. Cook
32. "Yarn Formation: Old, and New" - D. B. Brookstein
33. "Knit Picking" - L. H. Olson
34. "Finishing of Textiles, etc." - F. L. Cook
35. "Brainstorming - Useful Products from Fibers" - W. D. Freeston
36. "Fibers, Viscoelasticity and Design of Structures" - J. L. Lundberg
37. "Color: What is Color? How we Perceive Color" - W. C. Tincher
38. "Weaving, Plain and Fancy" - A. Tayebi
39. "Waking up with Craig: College Entrance, Application, etc." - C. A. Anderson
40. "Carpets: Ancient Asia to Dalton, Georgia" - W. C. Boteler
41. "Flammability: Combustion & Ignition & Propagation of Flames and Chars" - W. C. Tincher

42. "Polymers, Fibers, and the Future" - W. D. Freeston
43. Research Reports by Students
44. Research Reports by Students
45. Research Reports by Students
46. "Gradation: Presentation of certificates of participation and mementoes" - participants, parents, faculty, staff, and friends.

Extra Seminars

47. "Counselling at Tech, Effective Study Habits, Communicating, etc." - Barbara J. Winship
48. "How Well Do We Write?" - J. J. Bynum
49. "Computers: 1984?" - M. Konopasek
50. "Lab Safety" - F. L. Cook
51. "How We May Write Better" - J. J. Bynum

APPENDIX III - SCIENCE MOVIES

- +*1. THE BEACH - A RIVER OF SAND: Movement of sand along a shore.
- +*2. CAVITATION: Forms of cavitation and effects in applications.
- +*3. CHANNEL FLOW OF A COMPRESSIBLE FLUID.
- +*4. WHY MAN CREATES: Nature of the creative process.
- +*5. CRYSTALS - AN INTRODUCTION: Structures & properties of crystals.
- +*6. DOMAINS AND HYSTERESIS IN FERROMAGNETIC MATERIALS: Domain formation, magnetically soft & hard materials.
- +*7. FLOWS WITH LARGE VELOCITY FLUCTUATIONS.
- +*8. RHEOLOGICAL BEHAVIOR OF FLUIDS: Non-Newtonian flow & normal stresses.
- +*9. EVIDENCE FOR THE ICE AGE: Landscapes and glaciers.
- +*10. PRINCIPLES OF THE OPTICAL LASER: How lasers work.
- +*11. MAGNETIC FORCE: The earth's magnetic field.
- +*12. PHYSICAL CHEMISTRY OF POLYMERS: Structures & properties of polymers.
- +*13. LOW REYNOLDS NUMBERS FLOWS: Inertia-free, viscous flows.
- +*14. BRATTAIN ON SEMICONDUCTOR PHYSICS: Introduction to semiconductors.
- +*15. SIMILARITIES IN WAVE BEHAVIOR: Mechanical waves, properties.
- +*16. PROBING PLANETARY PROCESSES: Formation of the earth and moon.
- +*17. AGRICULTURAL GENETICS IMPROVES YIELDS: Plant genetics with emphasis on corn.
- + 18. HIGH BLOOD PRESSURE: Causes of high blood pressure, prevention, resulting disabilities, first aid, treatment, and living with it.
- + 19. THE NEW SOLAR SYSTEM: What we have learned about the solar system from our space program.
- + 20. STUDYING THE BIG CATS OF AFRICA: New understanding of the big cats from careful study and photography.

- + 21. SPEEDING SCIENTIFIC INFORMATION: Computer methods and use to avoid inundation in the information flood.
- + 22. MORE WATER FOR A THIRSTY WORLD: Our over-accelerating demands for water, conservation, recycling, and new sources.

+ Shown in 1976 SST program

* Shown in 1974 and/or 1975 program

Appendix IV - Group Activities

<u>Date</u>	<u>Activity</u>
Sunday, June 13	Open house & "Dutch treat" supper with parents and friends - Textile Engrg. Bldg.
Saturday, June 19	Soccer, coaching and games - Rebecca Byrd, girls' dorm counselor.
Sunday, June 20	Visit High Museum of Art and Underground Atlanta. Picnic outside Textile Engrg. Bldg.
Sunday, June 27	Open house and supper at Lundberg's home.
Sunday, July 4	Watch Peachtree Road Race (10,000 meter run). Visit Lenox Square for concert and fireworks.
Monday, July 5	Field day - athletic contests.
Sunday, July 11	Visit Stone Mountain Park.
Sunday, July 18	Open house and supper at Lundberg's home.
Tuesday, July 20	Visit Six Flags Over Georgia.
Saturday, July 24	*Visit Callaway Gardens (amusements, beach, lakes, etc.
Sunday, July 25	Picnic outside Textile Engrg. Bldg.
Tuesday, July 27	*Swim at Clemson University beach and supper at Coneross Fish Lodge.
Friday, July 30	"Graduation" and open house.

*Combined with educational field trips.

Appendix V - Students' Evaluation: Results

"Summer-76" (NSF-SSTP) Questionnaire

1. There were (too many 75%, too few 17%, right number 8%) seminars during the program.
2. Each seminar on the average was (too short 8%, too long 75%, right length 17%).
3. The ideal length for a seminar in the program would be (1 hr. 75%, 1 1/2 hrs. 17%, 2 hrs. 8%, 2 1/2 hrs., 3 hrs.)
4. Seminar material was (always, 17%, often 42%, seldom 42%, never 0%) at a level difficult for me to understand.
5. The seminars which interested me the most had as their subject:
 - a) Color & dyes (W. C. Tincher)
 - b) Fibers, textiles and the future (W. D. Freeston), Flammability (W. C. Tincher), Thermodynamics (J. L. Lundberg), Firemen's Turn-out Coat (C. Anderson), Our World of Giant Molecules (J. L. Lundberg)
6. The seminars which were least interesting had as their subject:
 - a) Stress-strain Behavior (J. L. Lundberg)
 - b) Near Equilibrium Kinetics (J. L. Lundberg), Probability (D.R. Gentry), Carpets (W. C. Boteler)
7. There were (too many 17%, too few 67%, right number 16%) colloquia given by people outside the textile department's faculty.
8. The most interesting colloquia were Fiber Optics (G. Yenizeski, Bell Labs.), Nonlinear Waves (W.F. Ames, Math, Ga. Tech), Agriculture, etc. (J.E. Bostic, USDA), Interpersonal Communication (E.J. Baker, Psych, Ga. Tech), Animal Behavior (R. K. Davenport, Psych, Ga. Tech).
9. The least interesting colloquia were: Nuclear Engineering (J.N. Davidson, Nucl. Eng., Ga. Tech)
10. There was (too much 33%, too little 25%, right amount 42%) material covered during the 7 week period.
11. There were (too many 33%, too few 42%, right number 25%) research topics from which to choose.
12. Research should be offered in the following areas: Mathematics, Health, Medicine, Botany, Psychology, Microbiology, Eight areas in which we offer research.
13. Faculty assistance on my research topic was (excellent 67%, good 8%, fair 17%, poor 8%).

14. Materials and instruments needed to carry out my research were (easy 83%, difficult 17%) to obtain.
15. (More 75%, Less 8%, right amount 17%) time should have been allotted for research.
16. (More 75%, Less 8%, right amount 17%) time should have been devoted to familiarizing me with Tech's research facilities.

Specifically: Library, Physical Testing Lab (Textile Engrg), Nuclear Reactor, Textile Engineering Labs., research in progress, campus layout.

17. The outing I most enjoyed was: Callaway Gardens (17%) - Am. Enka - Duke Power - Clemson Univ. (7%); Six Flags Over Georgia (58%); Fernbank Science Center (7%).
18. The outing I least enjoyed was: High Museum of Art and Underground Atlanta (25%), None (17%), Fernbank Science Center (17%), Callaway Gardens (17%).
19. I would like to have had (more 75%, less 17% right amount 8%) free time weeknights and weekends.
20. Had I had more free time I would have used it to 1. Do research (33%), 2. Meet people (33%), 3. Read (17%), 4. Study (17%), 5. Sleep (17%)
21. I would recommend this program to my fellow students if:
 - a) it were run much the same way (33%)
 - b) a few changes were made (50%)
 - c) the following major changes were made (7%)

1. Have fewer, shorter seminars 2. Have fewer seminars in textile engineering 3. Have more outings 4. Space outings better 5. Have more free time on weekends 6. Start the SST program at the start of summer quarter. (We'll do this in 1977).

(Please tell us what you think and how you feel about our summer program). Your comments will help us in plans for "summer-76".

1. Counselors should better coordinate activities. 2. Have fewer participants. 3. Learning to live together in the dormitories is a valuable experience.

Appendix VI

Comments from One Parent and One Teacher

From one parent:

"My wife and I would like to thank you for your training, education and stimulation provided to our son ----- this summer at the NSF summer school session. His enlightenment and the pleasure of his relating his experiences to us and others has been of great encouragement and blessing to us all. The efforts of you and your staff (and your wives who endured such an intellectual invasion) is almost beyond comprehension in this day of mass education.

----- is very enthusiastic about Georgia Tech and the programs offered there. I hope we can see our way clear to making the investment that your quality of instruction represents after he finishes his senior year.

Please express our thanks to your excellent staff."

From one teacher:

"I am writing to thank you, your staff, and everyone at Georgia Tech, who has helped-and continues to help-our community. ----- has returned from your NSF-SSTP with a revitalized interest in life, and infects everyone around her with the enthusiasm imparted her by you and your program. The results in a community such as ours are far-reaching. Our people become aware that they can succeed in that "outside" academic world; they become aware that there are those who have interest in them and will expend time and energies on them; and, most important, they become eager to try out that academic world for themselves.

As you may already know, ----- of our school and last year's SSTP is now enrolled at GA. Tech, and has recruited another of our students as well. He was also greatly responsible for ----- attending Ga. Tech this past summer. Your program--especially the people involved in it, did a great deal for him-and us. But the program's impact on ----- was phenomenal. A quote from her letter of 6/21/76 illustrates this:

'The environment is so thrilling here. I feel my life has been wasted up to this point. New vistas and horizons seem so much larger and wonderful. I can just feel a burning desire to learn all I can. I never was so deeply motivated. This place has given me unlimited inspiration. This is the honest truth.'

What can I add? We have never had such a positive response from any of our participants in any program as we have received from ----- and -----.

Sincere thanks from our school and community."